

stituent of soils, without which a proper mechanical texture cannot exist. Where there is no humus in the soil, no proper mechanical texture exists, nor can there be any regular source for the supply of carbonic acid to meet the wants of the growing crop. The supply of carbonic acid is, in truth, not altogether dependent on the condition of the soil itself, as is the case with water, which enters the system of plants exclusively through their roots, and therefore always by the medium of the soil. Independently of this manner of assimilation, carbonic acid is also taken up by the plants, to a large extent, directly from the atmosphere by the medium of their leaves. It has even been proven by experiment that plants can be raised in a soil entirely destitute of humus, in which case they are solely referred to this latter mode of appropriating their carbon. This state of things, however, merely shows to what extent plants can be forced to feed themselves in a partial manner, but in no way prove that under this condition their development is the most prosperous. Experience teaches us, on the contrary, that the co-operation of the humus in the soil is indispensable for securing a regular supply of carbonic acid to plants, and their production in the most perfect form. The gas arising from the humus furnishes a constant source of carbonic acid for that portion of the atmosphere which immediately rests upon the soil and surrounds the upper part of the plant. It also thoroughly penetrates the soil itself, in the very body of which it is produced, becomes there dissolved in water, and in this form most fit to enter the rootlets of plants and to provide thus a nutriment which plants, in their first period of life, cannot appropriate to themselves otherwise, being without leaves at that time.

A regular supply of carbonic acid for the whole term of the growth of the plant can therefore be secured only by the co-operation of humus, or what is the same, by a proper mechanical texture of the soil, and experience teaches us, in accordance with this, that the beneficial influence of the humus on the production of crops is so great that two soils of equal capacity will, *mutatis mutandis*, yield average crops in proportion to the quantity of humus they contain.

*Ammonia*, finally, is the substance from which the plant derives all its nitrogen, or about one per cent. of its whole weight. It is, like carbonic acid, a product of the decomposition of organic matter, and therefore most intimately connected with the occurrence of humus. Far the greatest mass of the organic part of plants consists of carbon and the elements of water, (hydrogen and oxygen,) and becomes con-